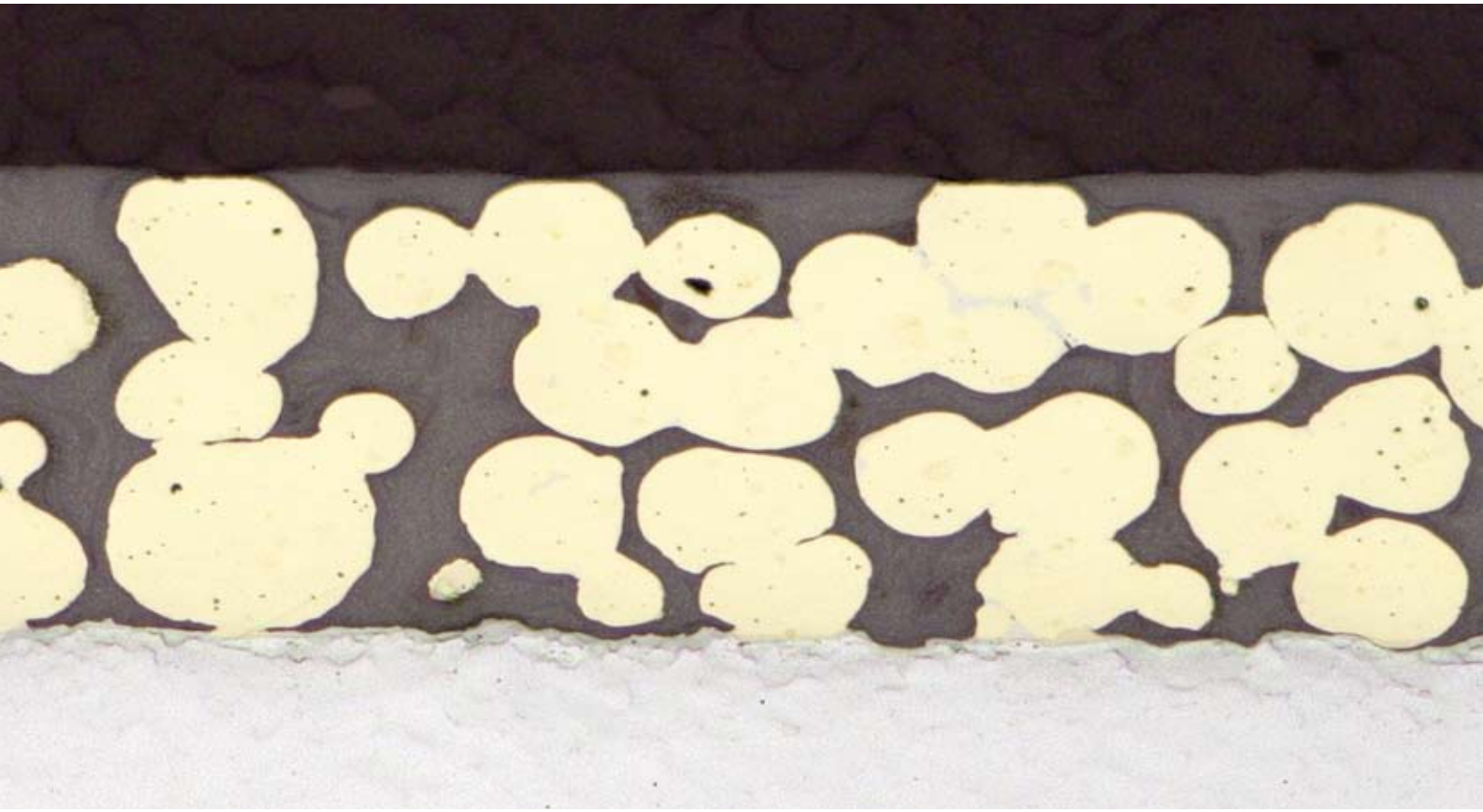
KOLBENSCHMIDT PIERBURG GROUP



KS P14

Lead-free Steel/Plastics Composite

GLEITLAGER

Brief description of the sliding material

KS P14 is a lead-free steel/plastics composite material for applications not requiring maintenance (dry run).

Its use in liquid-lubricated systems is also viable. Grease is only recommended conditionally as a lubricant in contact with KS P14.

The material is produced by applying a continuous sinter impregnation method. In a purpose-adapted process, the sliding surface of bronze is sintered onto a steel carrier material, leaving a mean pore volume of about 30 %. A solid lubricant mass is impregnated into these hollows and submitted to thermal treatment.

KS P14 features a low coefficient of friction and favorable wearing properties.

The material complies with the requirements of EU Directive 2000/53/EC on End-of-Life Vehicles.

Bearing structure

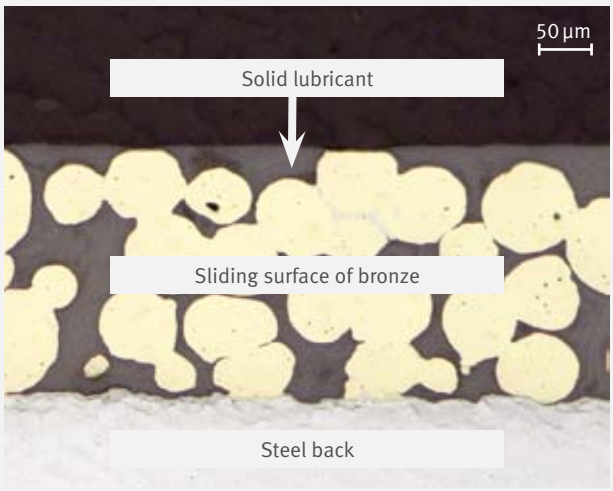
Sliding elements in KS P14 are composed of a steel back, a sintered-on, porous tin-bronze layer and the solid lubricant PTFE with ZnS as filler.

The steel carrier material used is typically of grade DC04. Its hardness ranges from 100 to 180 HB. The steel thickness is chosen as a function of the proposed application. Typical thicknesses are between 0.7 and 3.2 mm.

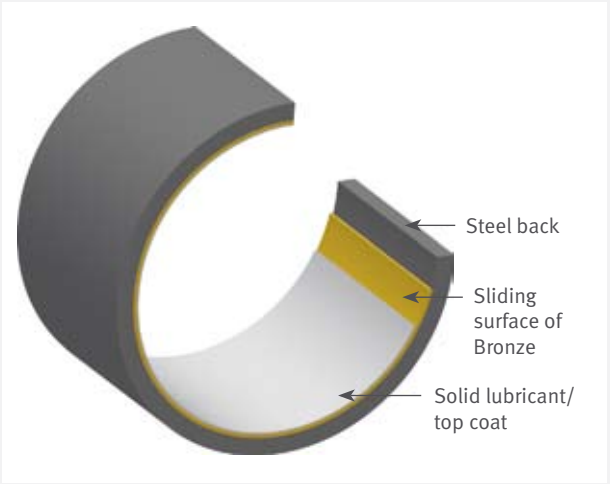
The contact surface is made up of spherical CuSn10 bronze. The bronze is sintered to exhibit a pore volume of about 30 %. The coat thickness is 0.2 – 0.35 mm. The pores are filled with a thermally treated solid lubricant which covers the bronze surface, acting as run-in coat. The run-in coat thickness is 0.005 – 0.030 mm.

Tribological system bearing/shaft in dry run

Besides load, sliding speed and ambient temperature as factors influencing wear, the shaft material also plays an important part in dry run mode. Depending on the shaft material, the expected service life of the plain bearing may substantially vary from the normal level. Also the surface roughness of the shaft also plays an important role. It should be in the range of R_z 1–3.



Micrograph of the composite



Layer system: steel back / sliding surface of bronze / solid PTFE lubricant

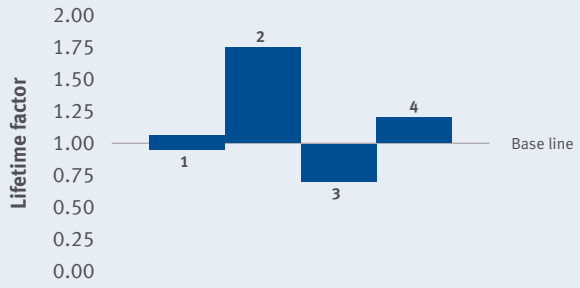
Material characteristics

Characteristics, limit loads	Unit	KS P14
Max. pv value	N/mm² · m/s	1.8
Permissible specific bearing load p		
■ Static	N/mm²	250
■ Very low sliding speed	N/mm²	140
■ Oscillating, vibrating	N/mm²	56
Permissible sliding speed v		
■ Dry run	m/s	2
■ Wet run	m/s	3
Permissible temperature range	°C	-200 to +280
Coefficient of thermal expansion	k^{-1}	$11 \cdot 10^{-6}$
Coefficient of thermal conductivity	$W \cdot (m \cdot k)^{-1}$	› 42

Chemical composition of the solid lubricant

in vol.-%		
	ZnS	25 %
	PTFE	75 %

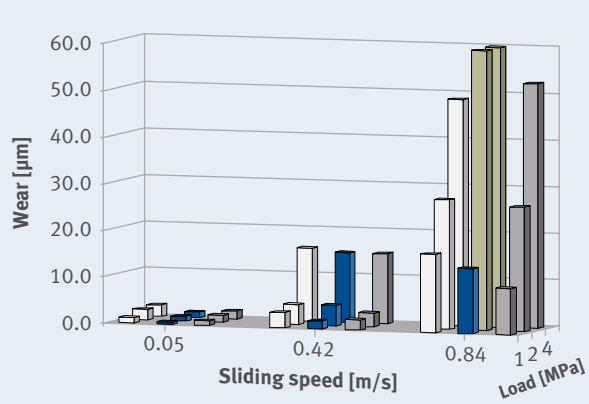
Lifetime factor of shaft materials (dry run)



1: Steel shaft X 155 Cr V Mo 121 (base shaft), hardness 58 HRc
2: Shaft of hard-anodized aluminum, hardness 450 HV
3: Shaft of gray cast iron (GG 25)
4: Steel shaft, nitrated, hardness 1000 HV, 0.2 mm deep

Test conditions
- Rotation
- Point load
- Sliding speed 0.42 m/s
- Specific load 2 N/mm²
- Shaft material cf. above diagram “lifetime factor of shaft materials”
- Surface roughness (shaft) ~ R_z 1.5 –3
- Room temperature
- Test duration 60 h

Non-lubricated wear



□ P10 ■ P14 ■ P141 ■ failed

Shaft material X 155 Cr V Mo 121, hardness 58 HRc

Manufacture of the sliding material

The solid lubricant mass is produced in a purpose-adapted mixing process. In parallel, bronze powder is pore-sintered onto steel in a continuous sintering process. Subsequently, impregnating rollers will feed and apply the solid lubricant. In a series of thermal process steps, the characteristic features of the integral tribological system are adjusted and then the necessary thickness accuracy of the composite is accomplished by means of controlled roller pairs.

Minor alterations of the contact surface color will not affect the performance of the plain bearing.

Plain bearing manufacture

Sliding elements of the most varied shapes are produced from KS P14 by cutting, punching and forming. Depending on each specific case of application, a fine-tuned corrosion protection treatment is carried through.

Quality

The complete manufacturing process is monitored and controlled by a close-meshed net of quality assurance measures.

Application

KS P14 has been designed for maintenance-free use. Thanks to its low coefficient of friction and favorable wear properties, KS P14 can be used in a wide range of applications in dry run as well as in liquid-lubricated systems. Grease is only recommended conditionally as a lubricant in contact with KS P14.

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